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Examining Knowledge Sharing in IS Development Projects: A Social Interdependence Perspective

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ABSTRACT

Information system development involves the coordinated application of business and information technology (IT) professionals' expertise. However, knowledge sharing between these two groups can be challenging. The problem is even more pronounced for projects involving external IT consultants with whom the business professionals have no prior collaboration. While previous research has studied various antecedents of knowledge sharing such as source, recipient, communication, and relational characteristics, it is often not clear how they may be manipulated to facilitate sharing. For this purpose, this paper studies the phenomenon from the social interdependence perspective, which suggests that goal, task, and reward interdependencies affect the extent of knowledge sharing in ISD project teams. Findings from a survey of 95 project teams indicate that goal, task, and reward interdependence are significant in determining knowledge sharing, which in turn influence project performance. Additionally, task interdependence partially mediates the relationship between goal interdependence and knowledge sharing. These results thus help to identify antecedents that are more tenable to managerial intervention. Implications of these findings for research and practice are discussed.

Keywords

Knowledge sharing, information system development, social interdependence theory, project performance.

INTRODUCTION

Information system development (ISD) involves the analysis, design, and implementation of IS applications or systems to support business activities in organizations (Xia and Lee, 2005). It is a knowledge-intensive activity requiring coordinated application of diverse expertise. Two types of knowledge critical to the success of ISD projects are business domain knowledge and information technology (IT) knowledge (Rus and Lindvall, 2002). These knowledge are shared between the IT and business professionals during the ISD process. For example, business domain knowledge is typically contributed by the business professionals during requirement analysis, and relevant IT knowledge is transferred from the IT consultants to business professionals during user training. Therefore, effective sharing and integration of IT and business knowledge are important to the success of ISD. Indeed, knowledge sharing has been found to have significant impact on project outcomes such as creativity (Tiwana and McLean, 2005) and system quality (Nelson and Coopridge, 1996).

To manage the complexity of developing IS, compensate for the lack of in-house expertise, and keep up with rapidly changing technology, many organizations engage external IT consultants or vendors (e.g., Accenture, IBM, and SAP) to assist in ISD (Ko, Kirsch and King, 2005). The worldwide IT services market is large, totaling US\$699 billion in 2006 (Savvas, 2007). The rationale behind employing external IT consultants is to harness the benefits of specialization. In this set up, IT consultants are often bounded by service level agreement and a black box approach is sometimes followed, where the external IT consultants rely on the formal requirement specification created by the business professionals to develop an IT solution in isolation. However, the lack of interaction between IT and business professionals in such an approach has been found to lead to poor project outcomes, especially in complex projects where boundaries of different expertise need to be spanned to tackle novel problems (Carlile, 2004). Hence, it is important to foster the coordination and cooperation between external IT consultants and business professionals during ISD. In this study, external IT consultants include employees of consulting agencies or IT vendors assigned to an ISD project. They are also collectively referred to as the IT subgroup. The business professionals include

business managers and users representing the client organization in the project and they are referred to as the business subgroup.

Even when the need for the subgroups of IT consultants and business professionals to share knowledge with each other is clear, it can be hard to achieve as their thought worlds differ⁴. The problem is even more pronounced for project teams involving external IT consultants with whom the business professionals had little prior collaboration history. Existing studies on knowledge sharing in ISD projects (e.g., Faraj and Sproull, 2000; Ko et al., 2005) have focused on the attributes of knowledge source (e.g., source credibility) and recipient (e.g., absorptive capacity), characteristics of communication channel (e.g., channel richness), and social relationship (e.g., trust). These aspects are either difficult to manipulate (except sometimes the communication channel) or require time to develop naturally. For this purpose, this study examines knowledge sharing between the subgroups of business professionals representing the client organization and external IT professionals from the social interdependence perspective (Deutsch, 1949), which suggests that the extent to which the two subgroups' goals, tasks, and rewards are interdependent determines how they cooperate with each other in ISD. Specifically, we seek answers to the research question: *How do the various forms of social interdependencies affect knowledge sharing between the IT and business subgroups during ISD?* Examining the effect of social interdependencies on knowledge sharing is valuable because they can be designed in project planning to encourage knowledge sharing during ISD.

This study seeks to contribute to research and practice in several ways. For research, this study enhances existing theoretical understanding of the phenomenon of knowledge sharing in ISD by viewing it from the lens of social interdependence. It also adds to the limited group-level knowledge management research by understanding the antecedents of knowledge sharing between business and IT professionals in ISD project teams. By empirically assessing the proposed research model and determining the relative importance of different types of social interdependence, results of this study are also useful to managers in designing effective mechanisms to promote knowledge sharing between IT and business professionals in ISD.

CONCEPTUAL BACKGROUND

Knowledge Sharing in IS Development

Knowledge sharing is defined as the communication of knowledge from a source so that it is learned and applied by a recipient (Ko et al., 2005). In the context of ISD, various antecedents of knowledge sharing between IT and business professionals have been identified. They can be categorized into attributes of recipient and source, characteristics of communication, characteristics of social relationship, and motivational factors (see Table 1). Among them, attributes of recipient and source, characteristics of communication, and characteristics of social relationship outline the circumstances that can affect knowledge sharing. However, they provide little understanding about participants' underlying motivations. As knowledge resides within individuals and remains unrecognized unless the owner is willing to make it available by codifying and sharing it, knowledge sharing can only be encouraged and facilitated but not compelled. Therefore, it is imperative to understand the motivations of knowledge sharers (Argote et al., 2003). A few studies have attempted to investigate this problem by examining the intrinsic and extrinsic motivations of IT consultants and client representatives in ERP projects (Ko et al., 2005). However, a view that is lacking in the literature is how interdependence between the subgroups can motivate knowledge sharing. This study suggests that perceived social interdependence can motivate the IT and business subgroups to cooperate by sharing knowledge with each other during ISD. The theory of social interdependence is further described below.

⁴ Member dispersion also adds to the challenge of knowledge sharing in IS development. However, this is outside the scope of the present study that focuses on knowledge sharing between business and IT subgroups in the same location (city).

<i>Type of Antecedents</i>	<i>Antecedents</i>	<i>Study</i>
Attributes of recipient	Absorptive capacity	Ko et al. (2005), Tiwana and McLean (2005)
	Decoding competency	Ko et al. (2005)
Attributes of source	Encoding competency	Ko et al. (2005)
	Expertise	Faraj and Sproull (2000)
	Professional experience	Faraj and Sproull (2000)
	Source credibility	Ko et al. (2005)
Characteristics of communication	Channel richness	Lind and Zmud (1991)
	Frequency	Lind and Zmud (1991)
Characteristics of social relationship	Arduous relationship	Ko et al. (2005)
	Mutual influence	Nelson and Coopride (1996)
	Mutual trust	Nelson and Coopride (1996)
	Shared understanding	Ko et al. (2005)
Motivational factors	Extrinsic motivation	Ko et al. (2005)
	Intrinsic motivation	Ko et al. (2005)

Table 4. Review of Antecedents of Knowledge Sharing between IT and Business Professionals

Theory of Social Interdependence

The theory of social interdependence describes how individuals interact in cooperative work situations. It posits that interdependence among team members can determine the extent to which they promote the success of others by cooperating (Deutsch, 1949). Three types of interdependencies identified by the theory are goal, task, and reward interdependence. *Goal interdependence* refers to the extent to which members in a subgroup believe that their subgroup's goals can be achieved only when the goals of the other subgroup are also met (Deutsch, 1949). It goes beyond goal alignment in that it requires the subgroups' goals to be not only compatible but also reliant on the goal attainment of one another. In the context of ISD, IT subgroup's goals may include delivering a high quality IS. Business subgroup's goals may include completing the project within schedule and budget. When the subgroups' goals are deemed as interdependent, interaction is promoted as subgroups are likely to try to facilitate each other's effort to achieve their goals by exchanging resources and information, giving and receiving feedback, and challenging each other's reasoning (Deutsch, 1949).

Task interdependence refers to the extent to which a subgroup believes that they depend on the other subgroup for being able to carry out their job (Deutsch, 1949). In the context of ISD, task interdependence results from the division of labor between IT and business professionals who possess specific expertise and contribute differently to the project. For example, during the initial phases of ISD, subgroups' tasks may be interdependent in that the business professionals need to communicate business requirements so that the IT consultants can translate them into system design that meets the requirements. When subgroups' tasks are interdependent, task completion requires collective action and they are therefore more motivated to closely coordinate their actions and share resources.

Reward interdependence refers to the degree to which a subgroup believes that their rewards depend on the performance of the other subgroup (Wageman, 1995). Organizations typically implement performance-related pay systems, which explicitly link financial rewards to individual or group performance. These structures are often designed such that rewards of individuals or groups are interrelated. In the context of ISD, reward interdependence is likely to be present when each subgroup's reward is based upon the entire ISD project team's performance. In this case, the subgroups are likely to be motivated to cooperate in order to maximize their overall rewards.

In sum, the theory of social interdependence suggests that goal, task, and reward interdependencies affect the level of interaction and cooperation in teams. Construing knowledge sharing as a key manifestation of interaction and cooperation in ISD, we propose that these interdependencies may account for the extent of knowledge sharing between the subgroups of business professionals and external IT consultants in ISD. We consider the concept of knowledge sharing to better portray the process of interaction between the subgroups of business and IT professionals in ISD as ISD is a knowledge-intensive process requiring exchange of not just explicit data and information but also tacit knowledge and expertise to support creativity. The concept of social interdependence is also highly congruent with the phenomenon of IT-business interaction in ISD, which can be viewed as a form of joint work where subgroups work with each other to achieve project objectives (Sherif, 1966) while attempting to maximize their own goals. A knowledge source at one point (e.g., business subgroup during requirement

specification phase) can become a knowledge acquirer (e.g., business subgroup during training phase) at another and this creates various interdependencies whose effects may be explained by the theory. Hence, the theory has the potential to offer insights into an important aspect of team dynamics in ISD that has received less attention in prior research.

RESEARCH MODEL AND HYPOTHESES

The proposed model is presented in Figure 1. The model posits that goal, task, and reward interdependencies between the IT and business subgroups in an ISD project team affect the extent of knowledge sharing between them. Goal interdependence is also hypothesized to affect task interdependence. Knowledge sharing is in turn expected to influence project performance. The model also controls for the effects of prior collaboration history, team size, project complexity, and the extent of boundary bridging activity to foster relationships between the two subgroups.

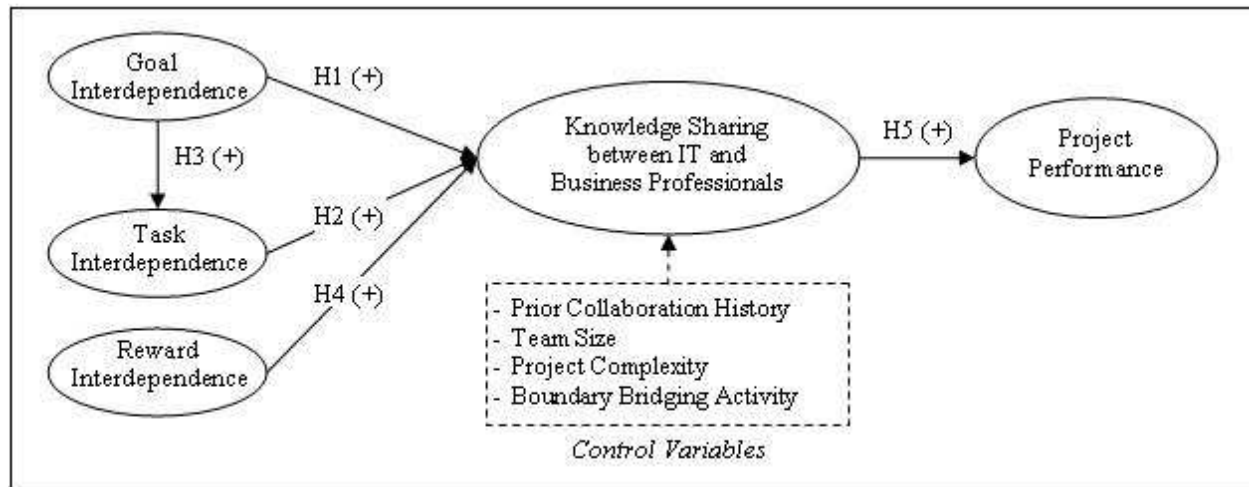


Figure 1. Research Model and Hypotheses

Goal Interdependence

With different background, expertise, and role in the project, the subgroups of business and IT professionals often have different goals of their own in addition to the project goals (Andres and Zmud, 2001-2002). When these subgroups' goals are interdependent, they tend to promote mutual goal attainment by coordinating and cooperating with each other (Deutsch, 1949). For example, a business subgroup may desire a system that can adequately address business needs and aim to complete the project within stipulated budget and time. On the other hand, the IT consultants may set a goal to implement a high quality system and explore and employ the latest technology where possible to diversify their portfolio. In this case, the first goals of both subgroups are largely interdependent as the business subgroup needs to count on the expertise of IT consultants to build the anticipated system and the IT subgroup relies on the judgment of business professionals in evaluating the quality of system. Awareness of this interdependence can induce the subgroups to work jointly to achieve their goals. Indeed, Amason and Schweiger (1997) have found that cooperative goals lead to more accurate information exchange. In contrast, the subgroups' second goals may be in conflict as new technology tends to be more expensive and require more time to learn, experiment, and apply, which may increase the time and cost of the project. If this conflict becomes a dominating concern, the subgroups may behave uncooperatively towards each other to prevent the other subgroup from achieving its goal since one's success is at the expense of the other. Therefore, we hypothesize that:

H1: The level of goal interdependence between the IT and business subgroups is positively related to the extent of knowledge sharing between them.

Task Interdependence

In ISD, knowledge sharing occurs through various phases including requirement analysis and system testing. During requirement analysis, business needs must be translated into preliminary system design. To facilitate this task, IT consultants depend on the business professionals to share their business knowledge while the business professionals

count on IT consultants' expertise to translate their requirements accurately into system design (Tiwana, Bharadwaj and Sambamurthy, 2003). During system testing, business professionals must rely on the IT consultants to impart their knowledge about the functionalities of the new IS to proceed with testing while IT consultants depend on the business users to provide feedback to facilitate further refinement. These task interdependencies create a situation of reciprocity whereby knowledge sharing is seen as a form of social exchange (Bock, Zmud, Kim and Lee, 2005). The knowledge contributing subgroup anticipates some future return for sharing their knowledge, most directly in the form of knowledge from the other subgroup that are relevant to their own tasks. High level of task interdependence has been found to stimulate exchange of knowledge on project requirements, task assignments, and implementation progress (Straus and McGrath, 1994). Accordingly, we hypothesize that:

H2: The level of task interdependence between the IT and business subgroups is positively related to the extent of knowledge sharing between them.

Goal and Task Interdependence

Previous studies have suggested that goal and task interdependence may be interrelated (e.g., Weldon and Weingart, 1993). When subgroups' goals are interdependent, the goal attainment of one subgroup relies on the goal attainment of the other subgroup. This motivates the subgroups to facilitate each other's goal achievement by working on tasks jointly when necessary. They may develop collaboration strategies to work on tasks that require expertise from both subgroups to maximize efficiency and goal accomplishment, in view of their aligned goal and common purpose (Mitchell and Silver, 1990). In contrast, when subgroups perceive that their goals are in conflict, they are likely to decouple their tasks and work on their own. They may be less concerned about the other subgroup and instead pay more attention on planning and executing their own tasks such that their own subgroup's goals are realized. Therefore, we hypothesize that:

H3: The level of goal interdependence is positively related to the level of task interdependence between the IT and business subgroups.

Reward Interdependence

In organizations, the structure of reward system provides a strong signal to employees about the type of behavior and outcome expected by the organization. Studies have shown that team-based rewards can foster team spirit and enhance members' willingness to contribute to the team's success (e.g., DeMatteo, Eby and Sundstrom, 1998). ISD projects can adopt team-based compensation system to encourage collaboration among members. For example, the IT and business subgroups may be rewarded based the overall quality of the resultant IS in addition to their individual contribution to the project (e.g., number of work hours). If the subgroups perceive that their reward is contingent upon the overall performance of the group, they are likely to adjust their efforts to maximize their collective rewards. Abdel-Hamid, Sengupta and Hardebeck (1994) have found that cooperative rewards can lead to greater interaction in software development projects. In contrast, if both subgroups perceive that their rewards are dependent on their own efforts and not on the other subgroup, they are unlikely to share knowledge. Accordingly, we hypothesize that:

H4: The level of reward interdependence between the IT and business subgroups is positively related to the extent of knowledge sharing between them.

Project Performance

In this study, project performance is defined in terms of efficiency and effectiveness. Efficiency of the ISD process refers to aspects such as productivity and adherence to schedule and budget. Effectiveness refers to the quality of outputs such as project deliverables and achievement of project objectives (Henderson and Lee, 1992). Studies have found that cross-unit knowledge sharing leads to innovative solutions as it promotes organizational learning by bridging different perspectives into juxtaposition, producing what Leonard-Barton (1995) called creative abrasion. Having shared, accurate, and complete software requirements is also fundamental for increasing ISD productivity and meeting users' needs, as work done during these early ISD stages affects the final outcome of the ISD project (Vessey and Conger, 1993). Therefore, we hypothesize that:

H5: The extent of knowledge sharing between the IT and business subgroups is positively related to project performance.

RESEARCH METHODOLOGY

The proposed model was assessed empirically with data collected through a survey. The step-by-step procedure recommended by Churchill (1979) was used to develop the survey instrument to maximize reliability. Content validity and construct validity were preliminarily assessed during instrument development through sorting procedures proposed by Moore and Benbasat (1991).

Construct Operationalization

Most items used in the survey were adapted from scales developed in previous studies. Each of the interdependence (*goal*, *task*, and *reward*) constructs was measured with at least three items and operationalized with two types of measure (Nelson and Coopriider, 1996). The first type is a *general* measure where respondents are asked to assess the overall level of interdependence between the IT and business subgroups (e.g., “the extent to which the goal attainment of the business subgroup and the IT subgroup was highly interdependent”). The second type of measure is *multiplicative* where respondents are asked to assess the perceived dependency of their subgroup on the other subgroup and vice versa (e.g., “the extent to which the goal accomplishment of the *business subgroup* depended on the goal accomplishment of the *IT subgroup*” and “the degree to which the goal accomplishment of the *IT subgroup* depended on the goal accomplishment of the *business subgroup*”). The responses were then combined using multiplication based the conceptualization of fit as interaction (Venkatraman, 1989). Similar operationalization has been effectively applied to assess mutual trust, mutual influence (Nelson and Coopriider, 1996) and to measure shared understanding and arduous relationship between client and consultant in IS implementation (Ko et al., 2005).

Knowledge sharing was operationalized in terms of the extent to which the subgroups exchanged specialized knowledge with each other during the course of the project (e.g., “the business (IT) subgroup always shares its specialized knowledge and expertise with the IT (business) subgroup”). *Project performance* was measured in terms of project efficiency and effectiveness. Dimensions of efficiency include productivity of team’s operation and adherence to budget and schedule. Aspects of effectiveness include quality of project team’s deliverables and attainment of project objectives.

For the control variables, *prior collaboration history* was assessed in terms of the number of members who had worked together before the project. *Team size* was measured by the number of IT and business professionals in the team. *Project complexity* was operationalized in terms of perceived novelty and difficulty of project (e.g., “the extent to which technology involved in developing the targeted IS is new to the project team”). *Boundary bridging activity* was measured in terms of the extent to which IT personnel from the client organization effectively coordinated activities and facilitated communication between the two subgroups (e.g., “the extent to which internal IT personnel have effectively coordinated activities between the subgroups”). The internal IT personnel were identified as the main boundary spanners because they are likely to be familiar with the business subgroup while sharing similar knowledge background with the IT subgroup.

Data Collection

The target population of this study is ISD projects involving external IT consultants. In sampling the respondents, we used a *matched-pair design* where both the IT and business subgroups in a project team were surveyed. To minimize recall error and ensure that the teams had enough opportunity to interact with each other at the time of survey, only ongoing projects that had completed at least one phase were included. Restricting the sample to ongoing projects was also necessary to avoid threats to internal validity as a result of maturation. In the survey, respondents were asked to answer all questions and report their project performance with respect to the last completed phase. Although final performance was not measured, intermediate/process project performance can reasonably be expected to indicate final performance as projects that experience cost and schedule overruns in one or more development phases are less likely to complete on time and within budget.

DATA ANALYSIS AND RESULTS

Out of the 105 project teams contacted, 95 teams responded yielding a response rate of 90.5%. This sample size exceeds the requirements suggested by Chin et al. (2003) for PLS analysis, which should be equal to the larger of

the following: (1) ten times the number of indicators in the largest formative construct, or (2) ten times the largest number of structural paths directed at a particular construct in the structural model. In our study, the largest formative constructs is project performance which has five items and the knowledge sharing construct has seven paths (including control variables) directed to it. This indicates that the minimum required sample size is 70 and our sample size is therefore considered sufficient for PLS analysis. Power analysis also indicates that the statistical power is 85%, which exceeds the recommended 80% threshold.

The characteristics of the sample are presented in Table 2. It can be observed that our sample includes projects in organizations of different sizes and industries and involves developing different types of IS.

<i>Characteristic</i>	<i>Frequency</i>	<i>Percentage</i>	<i>Characteristic</i>	<i>Frequency</i>	<i>Percentage</i>
Industry of Client Organization			Scheduled Duration (Months)		
Manufacturing	28	29.5	Less than 3	6	6.3
Finance: banking/insurance	18	18.9	3 to 6	21	22.1
Trade: wholesale/retail	3	3.2	7 to 12	40	42.1
Transportation services	4	4.2	13 to 23	21	22.1
Utilities and communications	14	14.7	24 or more	7	7.4
Construction and engineering	3	3.2	Last Completed Project Phase		
Education	1	1.1	System planning	15	15.8
Medical and legal services	1	1.1	Requirements analysis	12	12.6
Petroleum and chemical	5	5.3	System analysis and design	22	23.2
Others	18	18.9	Development and testing	21	22.1
Number of Employees in Client Organization			Rollout	25	26.3
Less than 500	16	16.8	Project Team Size		
500 to 999	15	15.8	Less than 10	20	21.1
1000 to 4999	33	34.7	10 to 49	58	61
5000 or more	30	31.6	50 to 99	10	10.5
Unspecified	1	1.1	100 or more	7	7.4
Type of Information System			Number of Members in Business Subgroup		
Document management system	5	5.3	Less than 10	50	52.6
Enterprise information system	18	18.9	10 to 49	40	42.1
Enterprise resource planning	36	37.9	50 to 99	3	3.2
Knowledge management system	6	6.3	100 or more	2	2.1
Transaction processing system	2	2.1	Number of Members in IT Subgroup		
Others	28	29.5	Less than 10	53	55.8
Type of Project Contract			10 to 49	32	33.7
Fixed-cost basis	78	82.1	50 to 99	5	5.3
Time-and-material basis	14	14.7	100 or more	5	5.3
Others	3	3.2	Members with Prior Experience with the Other Subgroup		
			0	36	37.9
			1 to 5	50	52.6
			6 to 9	2	2.1
			10 or more	6	6.3
			Unspecified	1	1.1

Table 5. Sample Characteristics

The proposed model was assessed using Partial Least Squares (PLS) analysis, which concurrently tests the psychometric property of each measurement scale and the strength and direction of relationships among constructs (Chin, Marcolin and Newsted, 1996). PLS analysis is also able to account for formative and reflective manifest variables that jointly occur in a single structural model. In our study, the interdependence and knowledge sharing constructs are considered reflective because they are uni-dimensional and exclusion of an item does not alter the meaning of construct. In contrast, the constructs project performance (measured in terms of project efficiency and effectiveness) and project complexity (measured in terms of perceived novelty and difficulty of project) are considered formative because the indicators compose and change the construct. All data was standardized before model testing as per PLS requirements.

Test of Measurement Model

Assessment of the measurement model includes evaluation of internal consistency, convergent validity, and discriminant validity of the instrument items. Reflective and formative constructs are to be treated differently because unlike reflective constructs, different dimensions of formative constructs are not expected to demonstrate internal consistency and correlations (Chin et al., 1996). To assess the relevance and level of contribution of each item to the formative constructs, the absolute values of item weight are to be examined instead. Prior collaboration history and team size are single-item measures and hence were not subjected to construct validity tests.

For reflective constructs, internal consistency was measured using Cronbach's alpha reliability coefficient. All reflective constructs in our models achieved scores above the recommended 0.70 (Nunnally, 1978). Convergent validity was assessed through item and composite reliability and average variance extracted (AVE). All reliabilities, item and composite, were above the recommended level of 0.70 and all AVEs were above 0.5 (Chin et al., 1996). Hence, convergent validity of the instrument was satisfactory.

Discriminant validity was assessed using factor analysis and item correlations. Five factors corresponding to the reflective constructs were extracted as expected and Kaiser-Meyer-Olkin measured 0.83 (which is well above the recommended value of 0.5) in factor analysis. All item loadings on stipulated constructs were greater than 0.5 and all eigenvalues were greater than one (Kaiser, 1974). The correlation matrix (see Table 3) showed that all the non-diagonal entries (construct correlation) did not exceed the diagonal entries (square root of AVE) for all constructs, indicating that measures of each construct correlated more highly with their own items than with items measuring other constructs (Fornell and Larcker, 1981). Thus, we concluded that the discriminant validity of all scales was adequate.

	GI	TI	RI	KS	PH	TS	BBA
Goal Interdependence (GI)	0.89						
Task Interdependence (TI)	0.44	0.73					
Reward Interdependence (RI)	0.53	0.41	0.85				
Knowledge Sharing (KS)	0.57	0.47	0.61	0.86			
Prior Collaboration History (PH)	0.01	0.02	0.11	-0.16	N.A.*		
Team Size (TS)	0.00	0.10	0.04	0.10	-0.33	N.A.*	
Boundary Bridging Activity (BBA)	0.48	0.37	0.53	0.57	-0.02	0.13	0.96

Table 3. Square Root of AVE vs. Correlation

* AVE is not applicable for single-item constructs

To assess the extent of multicollinearity, variance inflation factor (VIF) was calculated. Results indicated that VIF scores ranged from 1.08 to 1.55, which were well below the threshold value of 10 (Myers, 1990). Since data was collected from both the IT and business subgroups, common method variance as a result of single-source bias was unlikely.

For formative constructs, absolute value of item weight was examined to determine the relative contribution of items constituting each construct (Chin et al., 1996). Results indicated that productivity of project team's operation was the most significant aspect of project performance, and newness of technology involved in implementing the targeted system was the most salient aspect of project complexity. Since the measurement model was satisfactory, we proceeded to test the structural model.

Test of Structural Model

Results of structural model analysis are shown in Table 4 and Figure 2. It was found that all hypotheses were supported at 0.05 level. None of the control variables were significant. The model explained 47% of the variance in knowledge sharing and 52% of the variance in project performance.

Constructs	Path Coefficient	T Value	Result
Goal Interdependence (GI)	0.20*	1.89	H1 supported
Task Interdependence (TI)	0.20**	2.46	H2 supported
GI→TI	0.39***	5.03	H3 supported
Reward Interdependence	0.25*	2.27	H4 supported
Knowledge Sharing	0.72***	14.76	H5 supported
Prior Collaboration History	-0.13	0.92	Not significant
Team Size	-0.08	0.63	Not significant
Project Complexity	-0.18	0.82	Not significant
Boundary Bridging Activity	0.09	0.91	Not significant

Table 4. Test of Hypotheses

*p<0.05 (one-tailed T-value: 1.66); ** p<0.01 (one-tailed T-value: 2.37); *** p<0.001 (one-tailed T-value:

3.19);

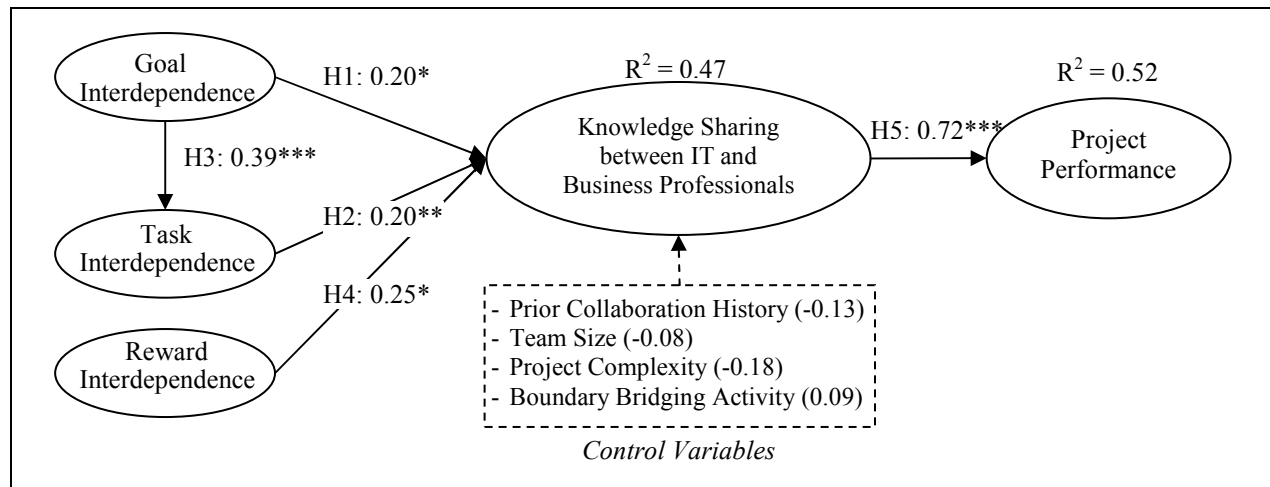


Figure 2. Test of Structural Model (* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$)

DISCUSSION AND IMPLICATIONS

The objective of this study was to investigate the effect of social interdependence on knowledge sharing in ISD. As hypothesized, we found that goal, task, and reward interdependencies significantly affected knowledge sharing, which in turn affected project performance. Goal interdependence is also found to be significantly related to task interdependence. Implications of these findings for research and practice are discussed below.

Implications for Research

For academics, the proposed model adds to existing research by putting forward a theory-based perspective to advance our understanding of knowledge sharing between business and IT experts in an ISD project. Our findings corroborate with previous knowledge management literature which emphasize the importance of considering social factors (e.g., Wasko and Faraj, 2005). Specifically, we have moved beyond the attributes of source or recipient and communication channel to consider social interdependencies between the source and recipient. Indeed, as a process requiring substantial teamwork, the significance of social interdependence factors deserves more attention in research.

Results of this study also contribute to literature on social interdependence by applying the theory in a novel context. Social interdependence theory has been studied most extensively in school education (Stanne, Johnson and Johnson, 1999), which has demonstrated that fostering cooperation can engage students in learning and help to achieve multiple educational goals. Our study extends existing work by demonstrating that the theory may also be effective in understanding cooperation beyond the education context, such as in the workplace.

The social interdependence theory has also helped to identify antecedents that are more tenable to managerial intervention for encouraging knowledge sharing in teams, as discussed below.

Implications for Practice

We found that goal interdependence has a positive effect on knowledge sharing. Thus, project managers should aim to establish goal interdependence between the two subgroups as early as possible. This can be achieved by clearly laying down the overall project goals and communicating them to both subgroups. Care should also be taken to align the goals of IT and business subgroups at the initial stages of the project (i.e., when the ISD project is being planned and the two subgroups are selected for the project). While it is possible for individual subgroups to have their own goals that may be in conflict, detecting the potential problem areas early and finding a middle ground can often prevent the conflicts from becoming insurmountable obstacles with negative outcomes.

Second, our results indicate that task interdependence encourages knowledge sharing between the subgroups. However, we do not suggest that task interdependence should be emphasized for all project tasks. Instead, focus

should be on tasks that require both IT and business knowledge to complete successfully (e.g., requirement analysis, system testing). Task interdependence can also be increased by setting interdependent goals for the subgroups, as shown by our findings. Working on various tasks jointly allow both subgroups to bring their expertise to bear in designing the system and this is likely to result in more realistic expectations of the resultant system.

Third, reward interdependence is also found to be effective in encouraging knowledge sharing. This suggests that the organizations should establish such interdependence between the subgroups by coordinating their rewards. For example, the rewards received by the IT subgroup can be tied to the quality of final system as judged by the business subgroup. At the same time, the rewards received by the business subgroup can be linked to their participation and quality of feedback. It should be noted that the two subgroups should not be made to compete for rewards from a fixed common pool. Rewards in the form of bonus given to the whole team are likely to be effective. To ensure that the subgroups are aware of their reward interdependencies, the reward structure should be clearly laid out and communicated.

Limitations and Future Research

Several opportunities for future research remain based on this study. First, as the data was collected in a cross-sectional survey, it did not allow us to draw conclusive evidence of causality, despite strong theoretical arguments and empirical support from past studies. Longitudinal studies are likely to provide stronger causal understanding of the proposed model. Second, the constructs were predominantly measured through subgroup self-reports and hence may be subjected to bias. To a certain extent, self-reporting is a suitable approach because the respondents are “insiders” who have unique perspectives concerning the kind of behaviors that were exhibited and hence were better able to make judgments. Nonetheless, validity can be improved by collecting more objective data, such as through observation of meetings, emails, and memos.

This study has operationalized and measured interdependence based on respondent’s overall perception in the previous phase of the project. As conditions change in different phases of a project, the level of interdependence may vary, especially if the project spans a long period of time. With the role of interdependence being significant as evident in this study, it may be fruitful to further investigate how the level of interdependence fluctuates in different phases.

Overall, studies such as this can inform research and practice by improving our understanding of how knowledge sharing can be facilitated in ISD project teams towards enhancing their performance and decreasing project failure rates.

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